

CLAIMS

1. A home terminal apparatus for sending/receiving packet data to and from a router that is connected to an external network to which a server apparatus is connected, the home terminal apparatus
5 being connected to the router via a home network, comprising:

a packet generation unit operable to generate packet data to be sent to the server apparatus;

a protocol determination unit operable to determine a communication protocol used between the home terminal apparatus
10 and the server apparatus; and

a communication unit operable to send/receive the packet data to and from the server apparatus via the router,

wherein the protocol determination unit determines that the home terminal apparatus should communicate with the server
15 apparatus using (i) a first communication protocol when the communication unit sends address notification packet data generated by the packet generation unit to the server apparatus periodically and repeatedly at a predetermined sending interval via the router, and (ii) a second communication protocol when the
20 communication unit sends/receives control information to and from the server apparatus.

2. The home terminal apparatus according to Claim 1,

wherein the protocol determination unit determines that the
25 packet generation unit should generate a connection request packet for making a connection request to establish a connection to the server apparatus using the second communication protocol, when the communication unit receives, from the server apparatus, a notification packet indicating an occurrence of a control request to
30 control the home terminal apparatus, and

the communication unit receives, from the server apparatus, control packet data including the control request, after the

connection is established to the server apparatus using the second communication protocol.

3. The home terminal apparatus according to any one of Claims
5 1 and 2,

wherein the first communication protocol is UDP, and
the second communication protocol is TCP.

4. The home terminal apparatus according to Claim 2, further
10 comprising a management unit operable to manage a certificate to
verify validity of the home terminal apparatus,

wherein the communication unit sends, to the server
apparatus, said certificate managed by the management unit, after
receiving the notification packet.

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5. The home terminal apparatus according to Claim 2,
wherein the packet generation unit generates an inquiry
packet for inquiring the server apparatus about the control request,
when the connection is established to the server apparatus using the
20 second communication protocol, and

the communication unit sends said inquiry packet to the
server apparatus via the router.

6. The home terminal apparatus according to Claim 1, further
25 comprising an authentication unit operable to perform
authentication on the server apparatus as a communication partner,

wherein the authentication unit performs the authentication
on the server apparatus using a server certificate to verify validity of
the server apparatus as a communication partner.

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7. The home terminal apparatus according to Claim 6;
wherein the authentication unit performs the authentication

on the validity of the server apparatus as a communication partner using one of the following information included in the packet data received by the communication unit: an IP address of the server apparatus; and a terminal ID unique to the home terminal apparatus.
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8. The home terminal apparatus according to Claim 6,
wherein the authentication unit destroys the packet data,
when the communication unit receives said packet data within a
10 predetermined interval.

9. The home terminal apparatus according to Claim 1, further
comprising an encryption unit operable to encrypt a channel
between the home terminal apparatus and the server apparatus that
15 uses the second communication protocol, when the control
information is sent/received to and from the server apparatus.

10. The home terminal apparatus according to Claim 9,
wherein the encryption unit uses SSL to encrypt the channel.
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11. The home terminal apparatus according to Claim 1, further
comprising a control unit operable to control the home terminal
apparatus according to the control information.

25 12. The home terminal apparatus according to Claim 11,
wherein a plurality of terminal apparatuses are connected to
the home terminal apparatus via the home network,
each of the terminal apparatuses includes an apparatus
control unit operable to control said each of the terminal
30 apparatuses itself,
the communication unit sends the control information to each
of the terminal apparatuses, and

the apparatus control unit controls said each of the terminal apparatuses according to the control information.

13. The home terminal apparatus according to any one of Claims
5 1 and 2,

wherein the server apparatus includes:

a second communication unit operable to send/receive packet data; and

a second packet generation unit operable to generate packet
10 data to be sent to the home terminal apparatus,

wherein the second packet generation unit generates the notification packet indicating the occurrence of the control request to control the home terminal apparatus, when said control request occurred in the server apparatus, and

15 the second communication unit sends said notification packet to the home terminal apparatus via the router.

14. The home terminal apparatus according to Claim 13,

wherein a mobile terminal device is further connected to the
20 external network, the mobile terminal device being capable of sending the control request to control the specific home terminal apparatus, and

the second packet generation unit generates the notification packet, when the second communication unit receives the control
25 request from the mobile terminal device.

15. The home terminal apparatus according to Claim 13,

wherein the second packet generation unit generates the control packet data including the control request, and

30 the second communication unit sends said control packet data to the home terminal apparatus via the router, after the connection is established to the home terminal apparatus using the second

communication protocol.

16. The home terminal apparatus according to Claim 15,
wherein the second communication unit sends the control
5 packet data to the home terminal apparatus via the router, only
when the control request occurred in the server apparatus.

17. The home terminal apparatus according to Claim 15,
wherein the second communication unit sends the control
10 packet data to the home terminal apparatus via the router, only
when receiving, from the home terminal apparatus, an inquiry
packet for inquiring about the control request.

18. The home terminal apparatus according to Claim 13,
15 wherein the server apparatus further includes:
a terminal information storage unit operable to store the
following information included in the packet data received by the
second communication unit as a set of terminal information: a
terminal ID of the home terminal apparatus; a global address of the
20 router which is a sender's address; and a global port number of the
router which is a sender's port number; and

an extraction unit operable to extract, from the terminal
information storage unit, the global address and the global port
number which correspond to the terminal ID, when the control
25 request to control the home terminal apparatus with said terminal
ID occurred in the server apparatus,

wherein the second packet generation unit generates the
notification packet that includes notification information indicating
the occurrence of the control request as well as including,
30 respectively as a destination address and a destination port number,
the global address and the global port number extracted by the
extraction unit.

19. The home terminal apparatus according to Claim 13,
wherein the server apparatus further includes a second
management unit operable to manage a server certificate to verify
5 validity of the server apparatus,

wherein the second communication unit sends, to the home
terminal apparatus, said server certificate managed by the second
management unit, after receiving, from the home terminal
apparatus, the connection request packet for requesting a
10 connection to the server apparatus using the second communication
protocol.

20. The home terminal apparatus according to Claim 13,
wherein the server apparatus further includes a second
15 authentication unit operable to perform authentication on the home
terminal apparatus as a communication partner,

wherein the second authentication unit performs the
authentication on the home terminal apparatus using a certificate to
verify validity of the home terminal apparatus as a communication
20 partner.

21. The home terminal apparatus according to Claim 13,
wherein the server apparatus further includes a second
encryption unit operable to encrypt a channel between the home
25 terminal apparatus and the server apparatus that uses the second
communication protocol, when the control information is
sent/received to and from the home terminal apparatus.

22. The home terminal apparatus according to Claim 13,
30 wherein an application server is further connected to the
external network,
the second packet generation unit in the server apparatus

generates the notification packet indicating the occurrence of the control request, the notification packet including an application server identifier for identifying the application server,

the second communication unit sends said notification packet
5 to the home terminal apparatus via the router,

the home terminal apparatus further comprises:

a storage unit operable to store application server identifier/address information made up of at least the application server identifier and an address of the application server; and

10 an extraction unit operable to extract, from the application server identifier/address information stored by the storage unit, the address of the application server that corresponds to the application server identifier included in the notification packet, when the communication unit receives said notification packet from the
15 router,

wherein the packet generation unit generates the connection request packet that describes the address of the application server as a destination address.

20 23. The home terminal apparatus according to Claim 22,

wherein the storage unit additionally stores a port number of the application server to the application server identifier/address information,

the extraction unit extracts, from the application server
25 identifier/address information stored by the storage unit, the address of the application server and the port number of the application server that correspond to the application server identifier included in the notification packet, when the communication unit receives said notification packet from the
30 router,

the packet generation unit generates the connection request packet that describes the address of the application server as a

destination address and the port number of the application server as a destination port number, and

the communication unit sends said connection request packet to the server apparatus via the router.

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24. The home terminal apparatus according to Claim 22,
wherein the storage unit further stores the application server identifier/address information that includes the application server identifier and a URL of the application server,

10 the extraction unit extracts, from the application server identifier/address information stored by the storage unit, the URL of the application server that corresponds to the application server identifier included in the notification packet, when the communication unit receives said notification packet from the router,
15 and

the communication unit sends the connection request packet to the URL.

25. The home terminal apparatus according to Claim 24,
20 wherein an address list notification server is further connected to the external network,

the address list notification server includes a sending unit operable to send, to the home terminal apparatus, an address list notification packet including another application server
25 identifier/address information via the router, and

the home terminal apparatus further comprises an update unit operable to update the application server identifier/address information stored by the storage unit, on the basis of said another application server identifier/address information included in the
30 received address list notification packet from the router.

26. The home terminal apparatus according to Claim 1,

wherein the router is directly connected to the external network, not via an internet service provider.

27. A communication system comprising:

5 a server apparatus connected to an external network;
a home terminal apparatus connected to a home network; and
a router which connects the external network and the home network,

wherein the home terminal apparatus includes:

10 a packet generation unit operable to generate packet data to be sent to the server apparatus;

a protocol determination unit operable to determine a communication protocol used between the home terminal apparatus and the server apparatus; and

15 a communication unit operable to send/receive the packet data to and from the server apparatus via the router, and

the server apparatus includes:

a second communication unit operable to send/receive packet data; and

20 a second packet generation unit operable to generate packet data to be sent to the home terminal apparatus, and

the protocol determination unit determines that the home terminal apparatus should communicate with the server apparatus using (i) a first communication protocol when the communication
25 unit sends address notification packet data generated by the packet generation unit to the server apparatus periodically and repeatedly at a predetermined sending interval via the router, and (ii) a second communication protocol when the communication unit sends/receives control information to and from the server
30 apparatus.

28. The communication system according to Claim 27,

wherein the second packet generation unit in the server apparatus generates a notification packet indicating an occurrence of a control request to control the home terminal apparatus, when said control request occurred in the server apparatus,

5 the second communication unit sends said notification packet to the home terminal apparatus via the router,

 the protocol determination unit determines that the packet generation unit should generate a connection request packet for making a connection request to establish a connection to the server apparatus using the second protocol, when the communication unit
10 in the home terminal apparatus receives the notification packet from the server apparatus, and

 the communication unit receives, from the server apparatus, control packet data including the control request, after the
15 connection is established to the server apparatus using the second communication protocol.

29. A communication method in which an external network to which a server apparatus is connected and a home network to which
20 a home terminal apparatus is connected are connected via a router, the communication method comprising steps A executed by the home terminal apparatus and steps B executed by the server apparatus,

 wherein the steps A include:

25 a packet generation step of generating packet data to be sent to the server apparatus;

 a protocol determination step of determining a communication protocol used between the home terminal apparatus and the server apparatus; and

30 a communication step of sending/receiving the packet data to and from the server apparatus via the router,

 the steps B include:

a second communication step of sending/receiving packet data; and

a second packet generation step of generating packet data to be sent to the home terminal apparatus, and

5 in the protocol determination step, it is determined that the home terminal apparatus should communicate with the server apparatus using (i) a first communication protocol when address notification packet data generated in the packet generation step is sent to the server apparatus periodically and repeatedly at a
10 predetermined sending interval via the router in the communication step, and (ii) a second communication protocol when control information is sent/received to and from the server apparatus in the communication step.

15 30. A program for a communication method in which an external network to which a server apparatus is connected and a home network to which a home terminal apparatus is connected are connected via a router, the program causing a computer to function as the units in the home terminal apparatus according to any one of
20 Claims 1 ~ 21.

31. A program for a communication method in which an external network to which a server apparatus is connected and a home network to which a home terminal apparatus is connected are
25 connected via a router, the program causing a computer to function as the units in the server apparatus according to any one of Claims 1 ~ 21.